

TABLE #2 SHOWING THE WEIGHT AND BULK OF RATIONS¹

[illegible]

Notes on Table #2 Showing the Weight and Bulk of Rations

Note #1: “This table is constructed upon the basis of a ration as allowed during the war and as ordinarily put up for transportation. The weight (net and gross) and bulk of 1,000 rations will, of course, vary with component parts put up, and with the kind of package used. In calculating the *bulk* of Subsistence Stores for purposes of storage or transportation, six and one-fourth (6¼) cubic feet are considered a *barrel*.¹

Note #2: “Consisting of ½ pork, ¼ salt beef, ¼ bacon, ½ flour, ½ bread, in boxes; beans or peas; rice or hominy; ¾ roasted and ground coffee, ¼ tea; sugar; vinegar; adamantine candles; soap; salt; pepper; molasses; potatoes.”²

Note #3: “Consisting of ½ pork, ¼ salt beef, ¼ bacon, bread in boxes; beans or peas; rice or hominy; ¾ roasted and ground coffee, ¼ tea; sugar; vinegar; adamantine candles; soap; salt; pepper; molasses.”³

Note #4: “Consisting of ½ pork, ¼ salt beef, ¼ bacon, flour; beans or peas; rice or hominy; ¾ roasted and ground coffee, ¼ tea; sugar; vinegar; adamantine candles; soap; salt; pepper; molasses.”⁴

Army regulations contain rationing tables. The 1861 regulations give the tare, net and gross weight of each component of one thousand rations and the bulk of one thousand rations in notional barrels of six and one-quarter cubic feet. The 1863 rations table gives net and gross weight and bulk. Tare weight is the weight of the empty container. The tare weight of an empty barrel dry coopered to contain flour was between 28 and 30 pounds. Tare weight was important to the Quartermaster’s Department because it represented necessary, albeit wasted, hauling capacity. Had it been possible to carry 30 pounds of fodder instead of the weight of the empty flour barrel, three of the mules in a six-up hitch could have been fed for one day. A

¹ Kautz, Brevet Major General August V. (1866 & 2002). [The 1865 Customs of the Service...](#) Originally published in 1866 by J. P. Lippincott and republished in 2002 in Mechanicsburg PA by Stackpole Books. pp. 159.

² Kautz, Brevet Major General August V. (1866 & 2002). [The 1865 Customs of the Service...](#) Originally published in 1866 by J. P. Lippincott and republished in 2002 in Mechanicsburg PA by Stackpole Books. pp. 159.

³ Kautz, Brevet Major General August V. (1866 & 2002). [The 1865 Customs of the Service...](#) Originally published in 1866 by J. P. Lippincott and republished in 2002 in Mechanicsburg PA by Stackpole Books. pp. 159.

⁴ Kautz, Brevet Major General August V. (1866 & 2002). [The 1865 Customs of the Service...](#) Originally published in 1866 by J. P. Lippincott and republished in 2002 in Mechanicsburg PA by Stackpole Books. pp. 159.

wagonload of ten empty barrels, 300 pounds, was enough weight to feed the whole team for five days. It can be readily appreciated that hauling tare weight was a two-edged sword. The ration components had to be carried in something, but that "something detracted from the hauling capacity of the wagon. A barrel traditionally holds 196 pounds of flour, which is also called the net weight of the barrel. (i.e., The Civil War flour ration was 22 ounces per man per day, so the net weight of the flour barrel equaled $142\frac{1}{2}$ flour rations). The net weight was important to the Subsistence Department because, in this example, it is used to determine the number of flour rations or hand, or the amount of bread that can be baked. The gross weight of the barrel is the sum of the tare weight and the net weight, in this case between 224 and 226 pounds. The gross weight is important to the Quartermaster's Department. The carrying capacity of a six-mule wagon was around 2,700 pounds under ideal road conditions, so a wagon could haul 10 barrels and a week's fodder for the team animals. Under normal operating conditions, 8 barrels were a full load.

The Quartermaster's Department estimated transportation requirements using a notional barrel of $6\frac{1}{4}$ cubic feet. Ten of these barrels were roughly comparable to the capacity of the wagon bed. A notional barrel of $6\frac{1}{4}$ cubic feet equaled:

- 10,800 cubic inches
- 46.753 gallons (U.S. liquid)
- 40.178 gallons (U.S. dry)
- 5.022 bushels (U.S. dry)
- 374.026 pints (U.S. liquid)
- 321.425 pints (U.S. dry)
- 187.013 quarts (U.S. liquid)
- 160.713 quarts (U.S. dry)

A barrel of salt is a close approximation to the notional barrel of $6\frac{1}{4}$ cubic feet. It weighed 20 pounds tare, contained 280 pounds of salt net (7,466.67 individual rations) and 300 weighed pounds gross.⁵ Its capacity was 5 Winchester bushels (i.e. 2,150.42 cubic inches per bushel) of salt, approximately $6\frac{1}{4}$ cubic feet, at 56 pounds per bushel. A short ton contains approximately $7\frac{1}{4}$ barrels of salt.

Example: Assuming that a six-mule wagon carries a payload of 2,700 pounds, how many wagonloads are required to transport 100,000 rations of salt beef? How many beef cattle are required to provide 100,000 rations of salt beef?

Solution: There are several ways to solve this problem using the table. Using the columns for 1,000 rations (i.e., the columns numbered 1-5) and remembering that

⁵ Martin, Brevet Major W. P. (1901) in How To Feed An Army. United States War Department, Washington DC. Government Printing Office, p. 113 & 116. (Digitized by Google Books: <http://books.google.com/bkshp?tab=wp>)

there are 100 units of 1,000 in 100,000; the tare, net, and gross weight, and bulk are calculated by multiplying the values in each column by 100:

- Tare weight (from column #2) of 100,000 salt beef rations = $989 \times 100 = 98,900$ pounds, so the empty barrels alone require 36.63 wagonloads
- Net weight (from column #3) of 100,000 rations of salt beef = $1,250 \times 100 = 125,000$ pounds, so the actual payload requires an additional 46.3 wagons.
- Gross weight (from column #4) of 100,000 rations of salt beef = $2,239 \times 100 = 223,900$, so a total of 82.93 wagonloads are required. This total can be checked by adding the wagonloads required for the tare and net weight of the rations: $36.63 + 46.3 = 82.93$.
- The bulk is obtained from column #5: $7.6666 \times 100 = 766.66$ barrels. Column #14 gives the gross weight of a barrel of salt beef as 292 pounds. The payload of the wagon is limited to 2,700 pounds, so each wagon is limited to 9 barrels. The number of wagonloads will change in this calculation because previous calculations were based on fractional wagonloads and fractional barrels (e.g., $82.93 / 766.66 = 9.24$ barrels per wagonload): $767 / 9 = 85.22$ or 86 wagonloads. It is worth noting that the 86 wagonloads were pulled by 516 mules and that the mules, when on full rations, consumed 11,868 pounds of food per day.
- Another way to solve the problem is to go directly to column #9 and multiply the gross weight of 100,000 rations by 2.239 and dividing the product by 2,700 pounds per wagonload. The result is, predictably, the same 82.93 wagonloads just mentioned. Using the bulk from column #10 also works the same. Multiply 0.0077 by 100,000 and divide the product by 9 barrels and the result is still 86 wagonloads.
- Columns 11-14 provide the tare (129 pounds), net (163 Pounds) and gross (292 pounds) weight of a barrel of salt beef. Given that the daily ration is $1\frac{1}{4}$ pounds of salt beef per man per day, then one barrel holds $(163 / 1.25)$ 130.4 rations and $(100,000 / 130.4)$ 766.87 barrels (~768 barrels) are required. At a gross weight of 292 pounds per barrel of salt beef, a wagonload is still $(2,700 / 292 = 9.25)$ 9 barrels, so $(768 / 9 = 85.33)$ 86 wagonloads are required.

Note: The previous section explained how a rationing table is used to calculate transportation requirements. Salt beef, however, is traditionally put up in barrels weighing 140 pounds tare, 200 pounds net and 340 pounds gross. There are $(200 / 1.25)$ 160 rations per barrel when rationed at $1\frac{1}{4}$ pounds of salt beef per man per day, so $(100,000 / 160)$ 625 barrels are required. Eight barrels per wagonload $(2,700 / 340 = 7.94)$ adds only 20 pounds to the total payload, so $(625 / 8 = 78.2 \sim 79)$ 79 wagonloads are required. Seven barrels per wagonload, a payload of 2,380 pounds, increases the transportation requirement to $(625 / 7 = 89.3) \sim 90$ wagonloads. These results are acceptably close to the estimates in the rationing table. In each of the examples worked to demonstrate the use of the rationing table, the resulting wagon train would have required at least one mile of road space and would have had a pass time of one hour.

Note: Between 222-230 beef cattle are required to ration 100,000 men, allowing 4% for wastage.

Note: Civil War soldiers received either a complete ration or a marching ration. Assume that they were issued a complete ration consisting of $\frac{1}{2}$ pork, $\frac{1}{4}$ salt beef, $\frac{1}{4}$ bacon, $\frac{1}{2}$ flour, $\frac{1}{2}$ bread, in boxes; beans or peas; rice or hominy; $\frac{3}{4}$ roasted and ground coffee, $\frac{1}{4}$ tea; sugar; vinegar; adamantine candles; soap; salt; pepper; molasses; potatoes. One thousand rations weighed 854.51 pounds tare, 3,031.09 pounds net, 3,885.6 pounds gross and they occupied a bulk of 19.1218 barrels. One hundred thousand rations weighed 85,451 pounds (i.e., about $42\frac{3}{4}$ short tons of empty barrels) tare, 303,109 pounds net, and 388,560 gross. One hundred thousand complete rations were packed in 1,912.18 barrels. Each notional barrel weighed 202.20 pounds gross, so 13 barrels made a wagonload (A wagonload of 13 barrels is theoretical. The 13 barrels occupied $81\frac{1}{4}$ cubic feet and the Army wagon had a capacity of 60 cubic feet to the tops of the sideboards. A wagon normally carried 10 barrels under ideal conditions. Twelve barrels of beans, flour, hominy and sugar were considered a wagonload under ideal conditions.) At least 147 wagonloads were required to transport one days' rations for 100,000 men using wagonloads of 13 barrels. The total increases to 160 wagonloads when wagonloads of 12 barrels are used and 192 wagonloads when 10 barrels per wagonload are hauled.